## 1. Introduction

It can be said that the most important development in the history of the air cushion vehicle has been the introduction of flexible skirts. From this development, what was a novel principle became a practical means of transport.

However with the introduction of skirts came the need to develop a new technology for their design and manufacture. New materials were required and satisfactory ways of attachment found. The very flexibility of the skirt has produced problems of its own particularly in the dynamic sense, and the motion of a craft depends largely on the characteristics of its skirt.

From this it can be seen therefore, that in designing an air cushion vehicle, far from flexible appendages being put on in the nature of an afterthought, the skirts and their design must be considered to be of prime importance.

## 2. The Purposes of Skirts

In the form of the SR.N1, the hovercraft first made its appearance without any flexible structure but with the peripheral jet issuing directly from the base of the craft. The hover height was of the order of $^1/_3$m (13 in) and because there was only hard structure, this height was the limiting size of obstacles that could be cleared. It was also found that, over water in very moderate waves, the speed was severely reduced by wave impact and the resulting vertical accelerations made the ride uncomfortable.

To give the craft more freedom of operation therefore required either greater clearance by putting more power into the lifting system or some way of increasing the clearance of the structure without a corresponding increase in the air gap around the periphery. This latter was the obvious choice on economic grounds and the way to achieve this was by fitting around and beneath the hard structure of the craft a flexible structure which was immediately termed a 'skirt'.

Thus the initial purpose of the skirts was to increase the obstacle clearance capability and also to extend the rough water capability. At the same time, by allowing a greater trim angle before there was rigid structure contact, the allowable centre of gravity range was increased considerably.

Once having introduced flexible structures around the craft, these can be designed to give other benefits. An inflated bag incorporated in the skirts at the junction with the rigid structure provides protection against damage of the structure by water impact. In particular, such a bag at the bow will prevent the craft from ploughing into the water with subsequent risk of overturning.

The dynamics of the skirts play an important part in determining craft response and behaviour and thus the design can be used to improve passenger comfort.

Where heavy loads are carried overland and speed is unimportant, the resulting high cushion pressures require skirts that will give the best possible seal with the ground thereby minimising lift power requirements. Over water the skirt is required to conform to the wave shape as far as possible so that cushion loss is minimal and at the same time the drag created by the water contact must not be too high.

## 3. Various Skirt Systems

There are many ways of using skirts to form and retain the air cushion. We shall consider those most commonly employed at the present time. However, initially we must define a term which will be employed to differentiate different types.

### 3.1 The Plenum

The use of the word 'plenum' in this and subsequent sections implies that the entire cushion and skirt air feed comes from a common source. The plenum can take the form of a space covering a high proportion of the plan area and lying between the main structural raft and the craft deck. This was employed on early craft such as the B.H.C. SR.N2 and SR.N3 (Figure 1).

Alternatively the bags of the skirt can be used to duct the air round the craft and thence to the cushion, as on the Vosper Thornycroft VT.1 (Figure 2).

Again the plenum can be formed partly by rigid structure and partly by the skirt bag. An example of this is the B.H.C. SR.N4 where there is plenum space beneath each of the side passenger cabins but across the width of the central car deck the air is conveyed by the skirt bags.